Protecting and Enhancing Natural Carbon Sinks: Natural Climate and Community Solutions (NCCS)

A healthy biosphere is critical to a stable climate system. For much of the Holocene, Earth's natural systems have maintained their essential role in the carbon cycle. However, recently global natural systems have become severely degraded and their capacity to serve as major carbon sinks is in grave danger. Deforestation and forest degradation of strategic ecosystems in the Amazon, Central Africa, and Southeast Asia continue to weaken tropical forests' natural carbon capture potential. This project aims to protect tropical forests through targeted technology breakthroughs, deep community engagement, and innovative bioeconomic opportunities as **natural climate and community solutions (NCCS)**, which are proven, cost-effective mitigation strategies capable of reducing global greenhouse gas emissions by a third.

STRATEGY

This white paper describes an approach to co-create, develop, and deploy a substantially enhanced technological toolkit in partnership with Indigenous peoples and local communities, and diverse partners at a biome-wide scale. It will:

- provide breakthrough capacity to monitor the health of tropical forests
- enable real time forecasting of deforestation and forest degradation risk,
- support transformation of the economic development paradigm via bioeconomy development.

Specifically, the project comprises three core pillars:

1. Community engagement and data collection framework
2. Data Processing, Forecasting, and Visualization Platform
3. Bioeconomy business model co-creation Incubator

TEAM

With the leadership of the MIT Environmental Solution Initiative (ESI), each of the three pillars described above will be led by co-PIs from diverse MIT schools and laboratories. Lincoln Laboratory will lead the design, testing, and deployment of data collection systems in pillar one. The MIT Computer Science and Artificial Intelligence Lab (CSAIL), the Terrer Lab at CEE, and the Human Systems Lab in the Department of Aeronautics and Astronautics will focus on developing the data processing models as well as the decision-support platform in pillar two. Co-PIs from the Sloan School of Management will focus on the creation of bioeconomy business models and conservation incentives in pillar three.

The Abdul Latif Jameel Poverty Action Lab (J-PAL) will support the development of evaluation metrics, establish connections to J-PAL–affiliated researchers to explore evaluating different pieces of the solution, and generate evidence on longer-term impacts. J-PAL will also support bringing the model on-the-ground in other countries with large primary forests through their extensive network of policy and research partners. Local communities and partners will be engaged through a comprehensive community-based planning process across all three pillars, including participatory research workshops in the early stages of the project.

The impacts of the solution can be broadly categorized into socioeconomic benefits for local communities and ecological benefits at the local, regional, and global scales. The implementation of the toolkit with local communities will create added value along regional value chains, increased technical capacity, and public participation in regional decision-making. Ecologically, the proposed NCCS will protect and enhance carbon sequestration capability, biodiversity, and other ecosystem services of tropical forests.